

REMARKS

Claims 24-26, 28-44, and 46 were pending when the present Office Action was mailed (February 22, 2007). In this response, claims 24, 38, and 46 have been amended, and claim 37 has been canceled. As a result, claims 24-26, 28-36, 38-44, and 46 are currently pending.

In the February 22, 2007 Office Action, all of the pending claims were rejected. More specifically, the status of the application in light of this Office Action is as follows:

(A) Claims 24-26 and 28-44 stand rejected under 35 U.S.C. § 112, first paragraph, as allegedly failing to comply with the written description requirement;

(B) Claims 24, 26, 33, 37, 41, 42, and 46 stand rejected under 35 U.S.C. § 103(a) as being unpatentable based on U.S. Patent No. 5,906,857 to McKee et al. ("McKee") and U.S. Patent No. 6,255,156 to Forbes et al. (Forbes);

(C) Claim 25 stands rejected under 35 U.S.C. § 103(a) as being unpatentable based on McKee, Forbes, and U.S. Patent No. 5,882,773 to Chow et al. (Chow);

(D) Claims 24, 28-30, and 32-44 stand rejected under 35 U.S.C. § 103(a) as being unpatentable based on U.S. Patent No. 5,505,986 to Velthaus et al. (Velthaus), McKee, and Forbes;

(E) Claim 25 stands rejected under 35 U.S.C. § 103(a) as being unpatentable based on Velthaus, McKee, Forbes, and U.S. Patent No. 5,242,709 to Chaffin III (Chaffin); and

(F) Claims 30-31, 38, and 39 stand rejected under 35 U.S.C. § 103(a) as being unpatentable based on Velthaus, McKee, Forbes, and U.S. Patent No. 4,857,802 to Fuyama et al. (Fuyama).

A. Response to the Section 112, first paragraph, Rejection

Claims 24-26 and 28-44 were rejected under 35 U.S.C. § 112, first paragraph, as allegedly failing to comply with the written description requirement. In particular, the Examiner alleged that there is no support for the feature of "placing first and second coating monitors closer to said substrate than to said first and second sources" in original claim 24. Without commenting on or conceding the merits of this rejection, and without prejudice to pursuing claim 24 in unamended or other forms, claim 24 has been amended to address the Examiner's concerns. The Examiner further alleged that there is no support for the feature of "wherein controlling stoichiometry of said vaporized components includes controlling temperatures of the first and second sources" in claim 26. The applicant respectfully traverses this rejection. The claimed subject matter is disclosed in the specification at page 4, lines 32-34. Claims 25 and 28-44 depend from claim 24. As a result, the Section 112, first paragraph, rejection of claims 24-26 and 28-44 should be withdrawn.

B. Response to the Section 103(a) Rejection Based on McKee and Forbes

Claims 24, 26, 33, 37, 41, 42, and 46 were rejected under 35 U.S.C. § 103(a) as being unpatentable based on McKee and Forbes. Claim 37 has been canceled without prejudice to pursuing this claim in a continuation, continuation-in-part, and/or other application. As a result, the Section 103 rejection of claim 37 is now moot. The following remarks address the Section 103 rejection of claims 24, 26, 33, 41, 42, and 46. Without commenting on or conceding the merits of this rejection, independent claims 24 and 46 have been amended to further clarify the claimed subject matter. Support for the amended subject matter can be found at page 4, lines 19-21, page 7, lines 16-19, and page 10, lines 2-8. For the reasons discussed below, the combined teachings in McKee and Forbes do not support a Section 103 rejection of these claims.

Claim 24 is directed to a method for the deposition of a thin film of a pre-determined composition onto a substrate. The composition comprises a ternary, quaternary or higher

composition. The method includes placing a first deposit at a first source of a vapour deposition apparatus and placing a second deposit at a second source of the vapour deposition apparatus. The first and second deposits are different, and components of the first and second deposits in combination form the pre-determined composition. The method also includes placing first and second coating rate monitors spaced from the first and second sources. The first coating rate monitor is shielded from deposition from the second source but open to deposition from the first source, and the second coating rate monitor is shielded from deposition from the first source but open to deposition from the second source. The method further includes effecting constant deposition of the components onto the substrate and the first and second coating rate monitors by simultaneously sputtering the components from the first and second deposits, independently measuring rates of deposition of the components onto the first and second coating rate monitors, and determining temporal variation of the deposition of the components based on the independently measured rates of deposition. The method further includes controlling stoichiometry of the sputtered components using the temporal variation of the deposition of the components as feedback to provide constant deposition on the substrate and the first and second coating rate monitors, thereby obtaining a continuous homogeneous temporal deposition of the composition on the substrate.

McKee discloses using shutters to control emission parameters for depositing vaporized materials from multiple sources. (Figure 10) During deposition, a deposition rate monitor is provided inside each of the sources and is shielded from materials being evaporated from other sources. (column 6, lines 1-3) The monitors are used to determine how long the shutters for the sources should be left open to cause a burst of evaporant with a defined mass to be emitted from the source. (i.e., $\text{mass} = \text{rate of evaporation} \times \text{time that the shutter is open}$). (column 6, lines 4-10) The shutters are configured to meter out pulses of evaporant with a controlled mass from the sources sequentially so as to be able to deposit precisely controlled sequentially deposited layers of different composition one

atom thick on the deposition substrate to form a laminated film with a composition that is heterogeneous on an atomic scale. (Figures 7-9)

Forbes discloses a porous silicon dioxide insulator having a low relative dielectric constant of about 2.0 or less. During processing, at least one layer of silicon carbide is deposited on a substrate using a chemical vapor deposition process, and the deposited layer is then etched to form a porous silicon carbide layer.

The combined teachings in McKee and Forbes do not support a Section 103 rejection of claim 24 because the combined teachings fail to disclose several features of this claim. For example, neither McKee nor Forbes disclose "effecting constant deposition of said components onto the substrate and the first and second coating rate monitors by simultaneously sputtering said components from said first and second deposits." Instead, McKee discloses metering out pulses of evaporant from the sources to sequentially deposit layers of different composition onto a substrate. As a result, McKee's deposition process is an intermittent deposition process, not a constant deposition process. Forbes discloses that a chemical vapor deposition process can be used for depositing a silicon carbide layer onto a substrate but does not provide any details of the deposition process. As a result, the Section 103 rejection of claim 24 should be withdrawn because the combined teachings in McKee and Forbes fails to disclose at least one feature of this claim. Claims 26, 33, 41, and 42 depend from claim 24. As a result, these claims are also patentable over the combination of McKee and Forbes for the reasons discussed above, and for the additional features of these claims. Claim 46 has been amended to include subject matter generally similar to that of claim 24. As a result, claim 46 is patentable over the combination of McKee and Forbes for the reasons discussed above, and for the additional features of this claim.

C. Response to the Section 103(a) Rejection Based on McKee, Forbes, and Chow

Claim 25 was rejected under 35 U.S.C. § 103(a) as being unpatentable based on McKee, Forbes, and Chow. As discussed above, the combined teachings in McKee and Forbes do not disclose each and every feature of claim 24. Chow was cited for disclosing measuring a deposition rate using crystal rate monitors, and so does not fill the void identified above. As a result, the combined teachings of McKee, Forbes, and Chow do not disclose each and every feature of this claim. Accordingly, the Section 103 rejection of claim 25 should be withdrawn for the foregoing reasons, and for the additional features of this claim.

D. Response to the Section 103(a) Rejection Based on Velthaus, McKee, and Forbes

Claims 24, 28-30, and 32-44 were rejected under 35 U.S.C. § 103(a) as being unpatentable based on Velthaus, McKee, and Forbes. Claim 37 has been canceled without prejudice to pursuing this claim in a continuation, continuation-in-part, and/or other application. As a result, the Section 103 rejection of claim 37 is now moot. The following remarks address the Section 103 rejection of claims 24, 28-30, 32-36, and 38-44.

Velthaus discloses a multi-source deposition process. (Figure 2) The deposition process controls the fluxes of each of the deposition source material by changing temperatures at each source to achieve a desired result. (column 3, lines 10-20)

The combined teachings of Velthaus, McKee, and Forbes do not support a Section 103 rejection of claim 24 because such a combination changes the principle of operation in Velthaus's deposition system. In particular, Velthaus discloses controlling individual fluxes of evaporated materials to be deposited onto a substrate in a feed-forward fashion. For example, Velthaus discloses that the temperature of each source is individually controlled to achieve a desired deposition result but does not disclose measuring the individual fluxes and controlling the temperature of each source based on the measured fluxes. On the other hand, McKee discloses a feedback control scheme using the measured evaporation

rate to adjust the temperature of each sources. Forbes does not how his deposition process is controlled. As a result, if Velthaus's deposition system were modified to include McKee's deposition rate monitors for adjusting the temperature of each sources, Velthaus's deposition system would be operating in a feedback fashion, contrary to the teachings in Velthaus. Further, there is no need to modify Velthaus's deposition system based on McKee because, according to Velthaus, the feed-forward control in Velthaus already provides "optimum conditions for deposition of a crystalline film" on a substrate. As a result, one skilled in the art would not modify Velthaus's deposition system based on McKee to come up with the arrangement of claim 24. Accordingly, the Section 103 rejection of claim 24 should be withdrawn. Claims 28-30, 32-36, and 38-44 depend from claim 24. As a result, these claims are also patentable over the combination of Velthaus, McKee, and Forbes for the reasons discussed above, and for the additional features of these claims.

E. Response to the Section 103(a) Rejection Based on Velthaus, McKee, Forbes, and Chaffin

Claim 25, which depends from claim 24, was rejected under 35 U.S.C. § 103(a) as being unpatentable based on Velthaus, McKee, Forbes, and Chaffin. As discussed above, the combined teachings in Velthaus, McKee, and Forbes do not disclose each and every feature of claim 24. Chaffin was cited for disclosing a crystal rate monitor used in the deposition of a phosphor film, and so does not fill the void identified above. As a result, the combined teachings of Velthaus, McKee, Forbes, and Chaffin do not disclose each and every feature of this claim. Accordingly, the Section 103 rejection of claim 25 should be withdrawn for the foregoing reasons, and for the additional features of this claim.

G. Response to the Section 103(a) Rejection Based on Velthaus, McKee, Forbes, and Fuyama

Claims 30-31, 38, and 39, which depend from claim 24, were rejected under 35 U.S.C. § 103(a) as being unpatentable based on Velthaus, McKee, Forbes, and Fuyama.

As discussed above, the combined teachings in Velthaus, McKee, and Forbes do not disclose each and every feature of claim 24. Fuyama was cited for disclosing depositing a dielectric layer on a substrate, and so does not fill the void identified above. As a result, the combined teachings of Velthaus, McKee, Forbes, and Fuyama do not disclose each and every feature of this claim. Accordingly, the Section 103 rejection of claims 30-31, 38, and 39 should be withdrawn for the foregoing reasons, and for the additional features of these claims.

H. Conclusion

In view of the foregoing, the claims pending in this application comply with the requirements of 35 U.S.C. § 112 and patentably define over the applied references. A Notice of Allowance is, therefore, respectfully requested. If the Examiner has any questions or believes a telephone conference would expedite prosecution of this application, the Examiner is encouraged to call the undersigned representative at (206) 359-6038.

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Respectfully submitted,

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